

Interactive
Comment

Interactive comment on “Role of convective transport on tropospheric ozone chemistry revealed by aircraft observations during the wet season of the AMMA campaign” by G. Ancellet et al.

Anonymous Referee #1

Received and published: 8 October 2008

This is a paper on an important topic, presenting significant measurements, of much interest and promise. Five air mass types are identified in two flight strategies, using chemical ratios and FLEXPART trajectories. Conclusions are reached about the role of convection in mixing material from surface to free troposphere (a vertical; and source; result), as well as mixing between northern and southern hemisphere (a horizontal; perspective). The analysis is done very well and the paper should be published after three areas are improved. First to be revised is the Introduction, where background, references and context for the

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



study need to be added. This would elevate the present paper, which resembles a technical report, to a significant scientific contribution. Second, in a similar vein, the Conclusions require major revision. Minor points of English are awkward; numerous suggestions below are provided to remedy this.

The three main issues to address:

1) The Introduction and background for the paper are inadequate. The authors are correct in referring to classic west African research (eg DECAFE) and to its focus on the lower troposphere. However, a considerable body of research on tropical tropospheric ozone and convection that is relevant to this work has been published. Although some of it is in different seasons or region, it laid the rationale for the AMMA flights and must be given credit. The results from the Jonquières et al, 1998 study (see reference list; also Jonquières and Marengo, JGR, 1998) should be described. Related to these findings are satellite (Edwards et al., JGR, 2003; R V Martin et al., JGR, 2002?) observations of ozone and CO that signal convection and interhemispheric transport over west Africa, Guinea Gulf and Intertropical Convergence Zone, as well as the tropical ozone paradox; papers with sondes and aircraft profiles (eg Thompson et al., GRL, 2000; Sauvage et al., JGR, 2006). Context for the present study should include these references. Convection-ozone links were explored, with major findings, in the 1980's and 1990's. Prior to CITE 3 (the Andreae et al., 1994 reference) was ABLE-2B, that deliberately targeted convection, which CITE 3 did not (Scala et al., JGR, 1990; Pickering et al., J. Geophys. Res., 97, 17985-18000, 1992). These and African and South American studies that quantified ozone formation post-convection should be referenced: Pickering et al., J. Geophys. Res., 101, 23,993-24,012, 1996; Thompson et al., J. Geophys. Res., 101, 24,251-24,278, 1996.

The innovative nature of the AMMA flights will be better highlighted in the Introduction if the past work is acknowledged. Then the authors can stress what is new in the present study, namely a chemical payload with more species than the 1990's ex-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



periments, better flight planning strategies, availability of models like FLEXPART, and results that are categorized according to different mechanisms and regions! Likewise, the Conclusions can summarize more explicitly the unique AMMA accomplishments. 2) Peroxide measurements as indicators of convection can be imprecise, largely due to uncertainties in the measurement method. Have these been taken into account? In referring to Snow et al., please discuss. 3) The overall results and their significance are not summarized effectively. The paper reads as an excellent report; but it would be more remarkable for readers and the field of tropical chemistry if you made stronger conclusions. One way to do this might be to make a map or diagram in the Conclusions (a weak section at present) and show the typical origins of the five types of air masses, ie where they were usually found, in a given region, *and* sources with arrows to signify transport. This approach would demonstrate more convincingly that the study had real motivation, you planned flights accordingly, found results agreeing with the hypotheses; and made important discoveries. The difference is a very fine paper, not just an ordinary one! It is worth putting effort into this! After the Introduction and Conclusion is revised, a more effective Abstract needs to be written that includes context provided by prior work.

Specific Comments, line by line -

Abstract, line 12. Air mass types, ie air mass is singular Line 15 - hydroperoxide is somewhat imprecise. Do you mean hydroperoxy radical, H₂O₂ [hydrogen peroxide], ROOH and H₂O₂ generically? As one reads through the paper the meaning seems to vary. Please be specific, especially in the Abstract and Introduction. Line 25 - delete possible;

Page 15943 - Line 11 - begin sentence with These projects aimed; lines 14-16 - upper altitude; is vague. Do you mean upper troposphere; as in line 15? Line 21 - Better style - delete Indeed;

Page 15944 - lines 4-6. Delete sentence about Modeling....; because

ACPD

8, S8045–S8050, 2008

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



you then tell us that a model study has been carried out and give the reference by Reeves et al Line 6. Delete 'Therefore'; (le English sentences are better begun in a direct fashion). Line 9. It is repetitious to say Moreover... also. Use only one of those words. Line 10. Delete 'like'; and replace with a comma after 'measurements'; Line 10. Again, clarify what is meant by 'hydroperoxides'; in this context Line 10. Better form... Replace 'for discussing'; with 'to determine'; the impact... Section 2.1 Very confusing. What is 'of the first kind'; and the second kind? Begin the section by saying 'Two kinds of flights were made ...'; - then describe what they are.

Page 15946 - 47. What is the 'accuracy'; of the chemiluminescent-based method? The calibrations described here are acceptable to prove consistency of the data but the reliability of the basic method needs support.

Page 15949 - line 6. Grammar 'All procedures are computer driven...'; Line 7. Can delete 'of this calibration.'; (It repeats) Line 11. Calibration coefficients have been corrected. HOW? Or add 'corrected by method of [reference needed].';

Page 15950 - line 2. Only *a* few observations.... Lines 18-19. Confusing sentence on CO difference method. Do you mean the delta is referenced to 100 ppbv?

Page 15951 - line 5. Plumes (plural) Lines 11-13. Better style. End sentence at ... 2006. Mixing ratios range from 100-400 ppt above 7 km and from 600-4000 ppt below.... Line 15. What is the logic of the RO₂ to ozone connection? Please clarify or provide a reference.

Page 15952. Line 16. 'Were encountered'; instead of 'have been encountered'; Line 18 'chosen to correspond to.'; Line 22 been (n is missing)

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

Page 15953. Line 1. Delete "the";. Simply start with "Table 1"; Line 3. "precursor"; - singular Line 12. ...produce a similar level... Line 10-17. This is confusing. In discussing the possibility for transport from the southern hemisphere (SH) to Cotonou, no context is provided. Why might it occur? What are the pathways of transport? Are there prior observations for this? References? If it seems important to mention, why not add a diagram that shows possible flow pattern?

Page 15954. Line 10. ..particle - no "s"; at end. Line 13. ...air mass in order to identify... would read better Line 22. *the* Middle East.

Page 15955. Line 8 - define MSG

Page 15956. Line 12. ...has not been discussed; not have been discussed. Line 16. The positions of which Line 21. Effects, not effect (singular).

Page 15957. Line 7. .. In the type V air masses. Line 14. ...on the 17 August

Page 15958. Line 6. Corresponds, not correspond

Page 15959. Line 2. ..in the presence of, not in presence of. Line 10. ...decrease, not decreases. Line 12. ..show, not shows Line 23. ...correspond, not corresponds Line 26. ..times scales, not scale, Line 29. ...where the ages, not age

Page 15960. Line 5 - replace to continue with in, ie in the discussion Line 8. Air masses, not mass Line 11. ...on the order of, not of the order... Line 22. Is there any conclusion about Type III or does it not occur in the peroxide data?

Page 15961. Line 4, 0.7, consistent with... Delete "so"; Line 5. Instead of So at the start of the sentence, it sounds better to say "Thus, it appears..."; or "Apparently,..."; Line 11. Uplift of a humid airmass Line 22. ..we notice - remove "can";

Page 15962. Line 1, "Nox chemical conversion... to what?"; Line 16.

ACPD

8, S8045–S8050, 2008

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



MSC which formed - can remove “has” Line 16, Chad is English spelling Line 17 ...second one that dissipated east... Line 19. MCS was studied ... Line 21. Younger than the previous...

Page 15963. Line 2. Chad spelling again Line 6. The system formed - delete “has” Line 10. The three flights listed are not given a type? Is that why they don’t appear in Table 1?

Page 15964. Line 7. 11 August flight... Word missing? Line 8. Concentrations, use tilde instead of “of the order of” Line 22. Second, (needs comma) Line 26. Third, (needs comma) Line 27. ..and consequently also on...” (Sentence does not make sense - something missing?) Line 28. It is necessary (remove ‘also’) Missing references in ROOH discussion, check Prather reference.

Page 15965. Line 2. Or why there “are” larger... (not “is”) Line 27. What is meant by using the word “preliminary?” “first adjusted?”

Page 15966. Line 12. Assuming, (needs comma) Line 13. Connects (needs “s”) efficiently Lines 25-29. Discuss the southern hemisphere influence on the NH CO in view of prior findings that NH helps support SH CO or ozone, eg papers by Jonquieres (TROPOZ), Edwards et al, 2003. This topic deserves amplification.

Page 15967. Line 12 extreme (not “extrema”) Lines 14-15. Chemical data are supported (not “have been”) Lines 20-27. See comments at the beginning about a diagram or map displaying the various air mass types and synthesizing the paper. The results here are too detailed.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 15941, 2008.

ACPD

8, S8045–S8050, 2008

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

